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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/623,757

07/21/2003

Jin Zhao

TI-35855

4854

23494 7590 04/08/2009  
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EXAMINER

SMITH, FRANCIS P

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

04/08/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/623,757	<b>Applicant(s)</b> ZHAO ET AL.	
	<b>Examiner</b> Francis P. Smith	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6, 13-18 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 13-18 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments as per the amended claims filed December 22, 2008 have been fully considered but they are not persuasive.

Claims 4, 16, and 20 are amended, claims 7-12 and 19 are withdrawn. Claims 1-6, 13-18, and 20 are currently pending and examined on the merits. The 112 rejection of the previous action dated 10/03/2008 is withdrawn in light of Applicants' amendments.

Applicants argue that a chamber maintenance procedure separate from the one or more plasma clean cycles is not accounted for in the Zhao reference. The examiner respectfully disagrees. Zhao teaches performing plasma cleaning after each wafer deposition. In addition, after approximately 1-25 wafers are processed, a chlorine plasma cleaning process is executed for a certain time (e.g. 80 seconds) at a specific flow rate (e.g. 200 sccm) (i.e. establishing a parameter), which is analogous to a volume of cleaning gas flowing per a time unit and measuring a time during the one or more plasma clean cycles to yield a measurement (as per the amendment for claims 4, 16, and 20). The plasma cleans are performed after a predetermined number of wafers have been processed. Since the flow rate and cleaning time are specified, the cleaning/chamber maintenance of Zhao is inherently performed after a predetermined volume of cleaning gas is utilized. Zhao discloses a wet clean/maintenance procedure

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where the chamber is opened to manually clean the chamber parts (col. 38, lines 1-57). It would have been obvious and well within the level of ordinary skill in the art at the time of the invention to replace faulty parts during this thorough chamber clean when deemed necessary (i.e. chamber maintenance as per the instant application).

***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-6, 13-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 6,189,482 B1).

Regarding claims 1, 13, and 20, Zhao teaches methods for depositing titanium films at rates up to 200 Å/min on semiconductor substrates via PECVD (e.g. depositing one or more layers outwardly from an inner surface of a reactor chamber of a chemical vapor deposition system, the one or more layers forming/calculating an accumulation layer as per claims 2, 3, 14, and 15) (see abstract). After the desired film has been deposited, the source reactant gases are turned off and a plasma purge sequence acts to loosen larger particulates formed on the chamber and various chamber components (col. 37, lines 44-56). In addition to the plasma purge clean done after each wafer deposition, additional cleaning procedures are utilized to avoid wafer contamination, which is conducted after every "X" wafers (preferably 1-25 wafers) (col. 38, lines 1-8). Chlorine and argon gas are flowed into the chamber at a rate of about 200 sccm, which will assist with cleaning plasma formation. The plasma is struck at about 400 watts and

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held for about 80 seconds, during which time the chlorine species reacts with unwanted deposits to etch said deposits from the chamber components (analogous to performing a plasma clean cycle by introducing the cleaning gas into the reactor chamber and establishing that the accumulation layer has reached a specified thickness. The volume of cleaning gas used will be known from the specified flow rate for a given time period, e.g. establishing a volume per time of flow of the cleaning gas/measuring the duration of the flow of the cleaning gas during the one or more plasma clean cycles to yield a measurement as per claims 1, 4, 5, 16, and 17) (col. 38, lines 14-43). Scheduled maintenance cleanings may be performed may be performed by opening the chamber lid to manually clean various parts of the chamber after about every 100-1000 processed wafers, which is analogous to scheduling a chamber maintenance procedure after a predetermined time (col. 38, lines 53-57).

Zhao does not explicitly state providing notification/scheduling a maintenance procedure once a predetermined volume of cleaning gas is used. However, Zhao does teach the use of a process sequencer subroutine that is designed to take into consideration the present condition of the process chamber being used in comparison with the desired process conditions for a selected process (col. 15, line 49-col. 16, line 5). A processor controls the operation of the chamber and subsystems according to instructions stored in memory via control lines. The processor executes system control software, which is a computer program stored in memory coupled to said processor (i.e. the software embodied in software as per claims 13-18). A process gas control subroutine has a program code for controlling process gas compositions and flow rates.

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The process gas control subroutine operates by opening the gas supply lines and repeatedly reading the necessary mass flow controllers, comparing the readings to the desired flow rates received from the chamber manager subroutine, and adjusting the flow rates of the gas supply lines as necessary. Steps are included for monitoring the gas flow rates for certain conditions (col. 16, line 56-col. 17, line 13). Thus, as Zhao teaches plasma clean cycles while monitoring the cleaning gas flow rate per unit time via the process gas subroutine, the claimed elements were known in the art at the time of the invention. Since person of ordinary skill has good reason to pursue the known options within his or her technical grasp, it would have been obvious to correlate the chamber cleaning cycles with the cleaning gas volume in order to monitor the amount of cleaning gas used for inventory purposes with anticipated success since both parameters are known.

As per claims 6, 18, and 20, Zhao does not expressly state replacing chamber parts during the maintenance procedure, however, it is well known and within the level of ordinary skill in the art to replace chamber parts once they become damaged, especially during scheduled maintenance.

### ***Conclusion***

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/F. P. S./

Examiner, Art Unit 1792

/Michael Kornakov/

Supervisory Patent Examiner, Art Unit 1792